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ICESat (GLAS) Science Processing Software Document Series

Volume
I-SIPS Software User's Guide/ Operational Procedures Manual Version 0.0

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Foreword

This document contains the I-SIPS Software User's Guide and Operations Procedures Manual. This document is developed under the structure of the NASA STD-2100-91, a NASA standard defining a four-volume set of documents to cover an entire software life cycle. Under this standard a section of any volume may, if necessary, be rolled out to its own separate document. This document is a combination of the user's guide and operations procedures manual rolled out of the Product Specification Volume.

The I-SIPS (ICESat Science Investigator-led Processing System) Software generates the GLAS standard data products and associated EOS required metadata.

The GEOSCIENCE LASER ALTIMETER SYSTEM (GLAS) is a part of the EOS program. This laser altimetry mission will be carried on the spacecraft designated EOS ICESat (Ice, Cloud and Land Elevation Satellite). The GLAS laser is a frequency-doubled, cavity-pumped, solid state Nd:YAG laser.

This document was prepared by the Observational Science Branch at NASA GSFC / WFF, Wallops Island, VA, in support of B. E. Schutz, GLAS Science Team Leader for the GLAS Investigation. This work was performed under the direction of David W. Hancock, III, who may be contacted at (757) 824-1238, hancock@osb1.wff.nasa.gov (e-mail), or (757) 824-1036 (FAX).

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Section 1

Introduction

1.1 Identification of Document

This is the User's Guide and Operational Procedures Manual for the I-SIPS (ICESat Science Investigator-led Processing System) Software. This document is a combination of the 2 documents rolled out of the Product Specification Volume of the NASA software engineering documentation [Reference: Applicable Document 2.2a] and is specified as a deliverable by the I-SIPS Software Documentation Tree in the GLAS Science Software Management Plan (SSMP) [Reference: Parent Document 2.1a].

1.2 Scope of Document

The I-SIPS Software User's Guide and Operational Procedures Manual applies to the operation of the V0 delivery of the I-SIPS Software.

1.3 Purpose and Objectives of Document

The purpose of this document is to provide the I-SIPS Software end users with instructions explaining how to operate the software effectively and to document actual operational procedures of the software.

1.4 Document Status and Schedule

This is the initial draft of the I-SIPS Software User's Guide and Operational Procedures Manual for the V0 delivery.

1.5 Document Organization

Section 1 is the introductory material for this document. Section 2 provides a listing of the reference documents. Section 3 discusses and overview of the I-SIPS Software. Section 4 and 5 are the User's Guide and the Operational Procedures Manual respectively. Supplemental information is provided in the subsequent sections.

Section 2

Related Documentation

2.1 Parent Documents

Parent documents are those external, higher-level documents that contribute information to the scope and content of this document. The following GLAS documents are parent to this document.

a) *GLAS Science Software Management Plan* (GLAS SSMP), Version 2.2, July 1998, NASA Goddard Space Flight Center Wallops Flight Facility, GLAS-SMP-1100.

The GLAS SSMP is the top-level Volume 1 (Management Plan Volume) document of the four volumes of NASA software engineering documentation [Applicable Reference 2.2c]. It dictates the creation and maintenance of the Product Specification Volume (Volume 2). This document is a roll out of the Product Specification Volume.

2.2 Applicable Documents

a) *NASA Software Documentation Standard Software Engineering Program*, NASA, July 29, 1991, NASA-STD-2100-91.

b) GLAS_Exec V0 Release Notes, JLee

c) V0 Version Description

d) I-SIPS SOftware Detailed Design Document

2.3 Information Documents

a) *GLAS Level 0 Instrument Data Product Specification*, Version 2.2, March 17, 1998, NASA Goddard Space Flight Center Wallops Flight Facility, GLAS-DPS-2610.

b) *GLAS Standard Data Products Specification - Level 1*, Version 2.0, January, 1999, NASA Goddard Space Flight Center Wallops Flight Facility, GLAS-DPS-2621.

c) *GLAS Standard Data Products Specification - Level 2*, Version 2.0, January, 1999, NASA Goddard Space Flight Center Wallops Flight Facility, GLAS-DPS-2641.

d) *GLAS Science Data Management Plan* (GLAS SDMP), Version 4.0, June 1999, NASA Goddard Space Flight Center Wallops Flight Facility, GLAS-DMP-1200.

Section 3

Overview of Software

3.1 Purpose

The I-SIPS Software generates the GLAS Standard Data Products and associated metadata describing the products and their quality and describing the product processing.

3.2 Functions

The I-SIPS Software functions for V0 are:

- Ingest the Level 0 data;
- Create the Level 1A, 1B, and 2 data products in the internal format; and
- Generate metadata describing the I-SIPS processing.

Future deliveries of the I-SIPS Software will include the following functions:

- Schedule and initiate processing;
- Ingest ancillary input data;
- Archive data;
- Allocate computer resources;
- Create Level 1A, 1B, and 2 data products in HDF and HDF-EOS;
- Deliver formatted data products to the National Snow and Ice Data Center (NSIDC) Distributed Active Archive Center (DAAC); and
- Generate the metadata describing the output products and their quality.

3.3 Options

The I-SIPS software can be executed to generate the GLAS standard products from Level 0 through the Level 2 products or to generate selected products only.

3.4 Restrictions and Limitations

The V0 delivery of the I-SIPS Software has the following limitations:

- Only the internal format of the GLAS standard data products (_SCF) will be generated.
- There will be a one to one correspondence between L1A and L2 GLA_SCF files. This means that the V0 software will not use multiple files of the same File Type for input to processing or reprocessing. This capability, however, will

be built into the control structures for future use and some of this functionality is already present in the V0 release.

- It is assumed that all input data will be time aligned with no missing data or error data.
- Imported ANC files will not be available.
- The GLA_ANC_06 file will not be created using the Toolkit.
- GLA_SCF files will be raw data only with no headers or metadata generated.
- GLA00 data will be time-aligned and all APIDs merged into a single binary file.

Section 4

User's Guide

4.1 Installation and Initialization

- Create a production directory for the GLAS_Exec program;
- Set execution path to binary distribution or executables directory (this location depends on where the executable is stored);
- Prepare control inputs; control inputs can be entered interactively or written into a control file; and
- Link input GLAS products and ancillary files to the production directory.

The last 2 items must be done by the end user for the V0 delivery. For V1 and beyond the I-SIPS Scheduler will generate the control inputs and link in the appropriate input files. Section 4.1.2 describes the control inputs.

4.1.1 File Naming Requirements

GLAS standard product files should be named as follows:

GLAxx_ccc_tttt_s.dat (for SCF-type file)

GLAxx_ccc_tttt_s.hdf (for HDF-type file)

where *xx* = Product ID
ccc = Cycle (000-999)
tttt = Track (0000-2600)
s = Segment, (0=none, 1-4 correspond to 50° lat/lon breaks)

GLAS ancillary data files should be named as follows:

ANCxx_TBD.dat

where *xx* = Product ID
TBD = To Be Determined

These conventions may be partially ignored for the V0 delivery. However, for GLAS_Exec to determine the type of each input file standard product files must begin with **GLAxx** and ancillary files must begin with **ANCxx**. The names are not case sensitive.

The list of input and output file types is contained in Table 4-1 "GLAS File List". See the GLAS Science Data Management Plan [Reference: Information Document 2.3d] for details on the GLAS input and output files.

Table 4-1 GLAS File List

File ID	File Name	File Disposition
GLA00	GLAS Instrument Packet File	input
GLA01	Altimetry Data File	input/output
GLA02	Atmosphere Data File	input/output
GLA03	Engineering Data File	input/output
GLA04	SRS and GPS Data File	input/output
GLA05	Waveform-based Range Corrections File	input/output
GLA06	Elevation File	input/output
GLA07	Backscatter File	input/output
GLA08	Boundary Layer and Elevated Aerosol Layer Heights File	input/output
GLA09	Cloud Height for Multiple Layers File	input/output
GLA10	Aerosol Vertical Structure File	output
GLA11	Thin Cloud/Aerosol Optical Depth File	output
GLA12	Ice Sheet Products File	output
GLA13	Sea Ice Products File	output
GLA14	Land Products File	output
GLA15	Ocean Products File	output
GLA ANC 01	Meteorological Data File	input
GLA ANC 06	GLAS Metadata and Data Product Quality Data File	output
GLA ANC 07	GLAS Coefficients and Constants File	input
GLA ANC 08	Precision Orbit Data File	input
GLA ANC 09	Precision Attitude Data File	input
GLA ANC 12	Digital Elevation Model	input
GLA ANC 13	Geoid File	input
GLA ANC 14	Pole Tide Model File	input
GLA ANC 15	Earth Tide Model File	input
GLA ANC 16	Load Tide Model File	input
GLA ANC 17	Ocean Tide Model File	input
GLA ANC 19	Surface Type Class File	input

4.1.2 Control Input Definition

In V0, the control input will be generated by hand and stored in a control file. Each instance of a GLAS_Exec run will require a separate control file since version and file naming information is within the control file. The suggested method is to modify one of the supplied control file templates or "recipes."

The control file is passed as a command line argument to GLAS_Exec. The secondary method of control occurs when GLAS_Exec detects that there is no control file argument passed on the command line. When no file is specified, GLAS_Exec runs through an interactive text-based interface which has the same options that could be specified by the control file. The dual-control method allows for a both tightly-controlled standard processing and easily customized special-case processing.

The Control File is based on the 'KEYWORD=VALUE' construct. The construct consists of a line containing a keyword / value pair delimited by an equals sign (=). The ordering of the keywords is not relevant but should follow a convention for consistency. Multiple instances of certain keywords are allowed. Comments may be placed in the control file by prepending the comment with a # character. Lines should be limited to a maximum of 80 characters.

Required single-instance keywords include:

TEMPLATE_NAME=Name of the control file template.
EXEC_KEY=Unique (per day) execution key
DATE_GENERATED=Date the control file was generated.
OPERATOR=Operator who generated the control file.
CYCLE=Cycle of data
REV= Revolution of data

Required multiple-instance keywords include:

INPUT_FILE=Input file and version.
OUTPUT_FILE=Output file and version

Optional multiple-instance keywords include:

SURFACE_TYPE=Surface Type to Process (for all ATBDs)
L1A_PROCESS=L1A Process to Execute
WAVEFORM_PROCESS=Waveform Process to Execute (or scenario)
ATMOSPHERE_PROCESS=Atmosphere Process to Execute (or scenario)
ELEVATION_PROCESS=Elevation Process to Execute (or scenario)

Additionally, pre-defined, subsystem-specific identifiers may specify which processes are executed, rather than a verbose list of processes. The SURFACE_TYPE keyword specifies over what type of surface processing should occur. The default is all surfaces. Keywords and values are not case-specific (they will be converted to all lower case during parsing) but it is recommended that, for consistency, keywords be entered in upper case.

Appendix A contains a table of the control file keywords and their acceptable values and the V0 control file templates.

4.2 Start-up and Termination

To start-up the I-SIPS Software execute GLAS_Exec with an input control file or execute GLAS_Exec and enter control information at the prompts. The software automatically terminates upon reaching the end of the input data or the detection of a fatal error. To determine how the software terminated, review the GLA_ANC_06 file. The UNIX 'grep' command may be used to extract items of particular interest from the ANC06 file. For example, to see the versions of programs and libraries, use this command:

grep -i VERSION *anc06_filename*

4.2.1 GLA_ANC_06 File Definition and Format

A GLA_ANC_06 file will be generated for each execution of the GLAS_Exec. The file will contain processing information and status, error messages, QA data, and data required to generate the GLAS product metadata. The GLA_ANC_06 will be opened and initialized by GLAS_Exec. The GLA_ANC_06 file is an ASCII file and the contents are in keyword = value format. The value is a time-stamped ASCII message. A sample GLA_ANC_06 file is shown in Figure 4-1 "Sample GLA_ANC_06 File" on page 4-5.

The GLA_ANC_06 keywords defined for the V0 delivery are:

VERSION
ERROR
GLAS_EXEC_STATUS
L1A_STATUS
WF_STATUS
ATM_STATUS
ELEV_STATUS
GLAS_EXEC_ SUMMARY
L1A_SUMMARY
WF_ SUMMARY
ATM_ SUMMARY
ELEV_ SUMMARY
{and all acceptable Control file keywords}

For V0, GLAS_Exec and GLAS_Exec's supporting routines write processing status and summary information and error messages to the GLA_ANC_06 file. The name of the GLA_ANC_06 file is a GLAS_Exec control input. Users can use grep or another search mechanism to review the values of specific keywords in the GLA_ANC_06 file.

```
VERSION          =        0 GLAS_EXEC V0.1
VERSION          =        0 PLATFORM_LIB V0
VERSION          =        0 CIO_LIB V0
VERSION          =        0 IO_LIB V0.2
VERSION          =        0 CNTL_LIB V0.6
VERSION          =        0 L1A_LIB V0.1
VERSION          =        0 WAVEFORM_LIB V0.1
VERSION          =        0 ATMOSPHERE_LIB V0.1
VERSION          =        0 ELEVATION_LIB V0.1
CONTROL          =        0 DATE_OF_RUN=29-March-1999 06:28:12
CONTROL          =        0 TEMPLATE_NAME=L1A_AND_PARTIAL_WF_CONTROL_FILE
CONTROL          =        0 EXEC_KEY=000012
CONTROL          =        0 DATE_GENERATED=26-January-1999
CONTROL          =        0 OPERATOR=jlee
CONTROL          =        0 CYCLE=01
CONTROL          =        0 REV=2000
CONTROL          =        0 SURFACE_TYPE=ALL
CONTROL          =        0 INPUT_FILE=gla00_01_2000_0.dat       1
CONTROL          =        0 INPUT_FILE=anc07_01_2000_0.dat       1
CONTROL          =        0 OUTPUT_FILE=gla01_01_2000_0.dat      2
CONTROL          =        0 OUTPUT_FILE=gla02_01_2000_0.dat      2
CONTROL          =        0 OUTPUT_FILE=gla03_01_2000_0.dat      2
CONTROL          =        0 OUTPUT_FILE=gla04_01_2000_0.dat      2
CONTROL          =        0 OUTPUT_FILE=anc06_01_2000_0.dat      2
CONTROL          =        0 L1A_PROCESS=ALL
EXEC_STATUS      =        0 GLAS_Exec Start of Processing
L1A_STATUS       =        0 L1A Started Processing
ERROR            =      123 2798 Frame checksum error
ERROR            =      124 1078 Previous GLA00 Record Missing
EXEC_STATUS      =     1500 End of Processing
```

Figure 4-1 Sample GLA_ANC_06 File

4.3 Functions and Their Operation

GLAS_Exec - This is the program that will generate the GLAS Standard data products. GLAS_Exec reads the input files record by record and generates the output data record by record. Ancillary data is read entirely by GLAS_Exec during initialization when the ancillary data file is manageable enough to handle in core. Otherwise, the ancillary data is read as it is required by the subroutines need it as input.

4.4 Status, Error and Warning Messages

Errors have 4 levels of severity:

- No error (0)
- Information / status (1)

- Warning (2)
- Fatal (3)

V0 Error codes, messages, and their associated severity are contained in Table 4-2 "Error Codes". Messages generated during the execution of GLAS_Exec will be written to the GLA_ANC_06 file.

Table 4-2 Error Codes

Error Code	Message	Severity
-1000	Number of Records Processed:	0
-1010	Number of Records Read:	0
-1030	Number of Records Written:	0
-1040	Process Execution.	0
-1050	Opened file:	0
-1060	Closed file:	0
-20001	L_Alt subroutine status	0
-20002	L_Atm subroutine status	0
-30001	W_Assess subroutine status	0
-30002	W_CalcOtherCh subroutine status	0
-30003	W_DetGeoSurTyp subroutine status	0
-50001	e_calcloadtd subroutine status	0
-50002	e_calcoceantd subroutine status	0
-50003	e_calcearthtd subroutine status	0
-50004	e_calcpoletd subroutine status	0
-50005	e_getgeoid subroutine status	0
-50006	c_intrppod subroutine status	0
-50007	e_calcrange subroutine status	0
-50008	c_calcsploc subroutine status	0
-50009	e_calcatmqf subroutine status	0
-50010	e_calcslope subroutine status	0
-50011	e_calcrefl subroutine status	0
-50012	e_chkreg subroutine status	0
-50013	e_calctrop subroutine status	0
-50014	e_calcregparm subroutine status	0

Table 4-2 Error Codes (Continued)

Error Code	Message	Severity
-50015	e_calcrngoff subroutine status	0
-40001	A_aer_lays subroutine status	0
-40002	A_aer_opt_prop subroutine status	0
-40003	A_avg_bscs subroutine status	0
-40004	A_cal_cofs subroutine status	0
-40005	A_cld_lays subroutine status	0
-40006	A_cld_opt_prop subroutine status	0
-40007	A_g_bscs subroutine status	0
-40008	A_interp_met subroutine status	0
-40009	A_intrp_geoloc subroutine status	0
-40010	A_ir_bscs subroutine status	0
-40011	A_mbscs subroutine status	0
-40012	A_pbl_lay subroutine status	0
10000	Error Opening File for Input:	3
10100	Error Opening File for Output:	3
10200	Error Closing File:	3
10300	Error Reading File:	3
10400	Error Writing File:	3
10700	Multiple single-instance keywords:	1
10800	Multiple-instance keyword limit exceeded:	3
10900	Unrecognized line in control file:	1
11000	Unknown value in keyword/value pair:	1
11100	I/O Error Opening Control File:	3
11200	I/O Error Reading Control File:	3
11300	Specified Unknown File Type:	1
11400	GLA01 Unknown Record Type	3
11500	GLA00 Unknown APid	1
11600	GLA00 Wrong APid	1
11700	Max APIDs per sec exceeded	3

Table 4-2 Error Codes (Continued)

Error Code	Message	Severity
20200	Error reading PAD data Eng data	3
20304	Error reading PAD data Eng data	3
30400	Error in Waveform Assess	3
35600	Error in Waveform Calc	3
45000	Error calculating backscatter	3
49444	Error calculating Backscatter Profile	3
50000	Error Calculating tides	3
59999	Error in Geoids module	3

4.5 Recovery Steps

For V0 if GLAS_Exec terminates with an error:

- Review error and status messages to determine source or location of problem;
- Correct the problem; and
- Re-Execute GLAS_Exec

Section 5

Operational Procedures

There are 4 standard operating scenarios for the V0 delivery of the I-SIPS Software: End-to-End, Atmosphere, Elevation, and Partial Elevation. This section describes these scenarios and their operating procedures.

End-to-End - Reads GLA00 as input and generates all Level 1 and 2 standard data products: GLA01-GLA15.

Atmosphere - Reads the GLA02 file as input and generates the Level 1B and 2 atmosphere products: GLA7-GLA11.

Elevation - Reads the GLA05 file as input and generates the Level 1B and 2 elevation data products: GLA06 and GLA12-GLA15.

Partial Elevation - Reads the GLA05 file as input and generates the Level 1B elevation data product: GLA06

A control file template exists for each of the operating scenarios (end-to-end.template, atm.template, elev.template, and part_elev.template). The templates are shown in Appendix A and are stored in a TBD directory.

5.1 System Preparation and Set-up Procedures

To prepare GLAS_Exec for execution, create the input control file for desired operating scenario:

1) Copy the appropriate control file template from TBD to the working directory and rename using the UNIX copy command. For example:

   cp TBD/end-to-end.template *workdir*/end-to-end07312001

   where TBD is the path name of control file template directory and *workdir* is the working directory name.

2) Edit the control file with the appropriate input and output file names using vi or some other text editor.

5.2 Standard Operating Procedures

To execute GLAS_Exec perform the following steps:

1) Execute GLAS_Exec at the system prompt including the control file name on the command line:

   GLAS_Exec end-to-end07312001

2) Determine status of execution by reviewing the output ANC06 file specified in the control file. Check for system status and errors by using the UNIX

grep command. For example to determine summary status information:

grep -i STATUS_SUMMARY *ANC06_file_name*

To determine if any errors occurred:

grep -i ERROR *ANC06_file_name*

5.3 Fault Recovery Procedures

1) Review error and status messages to determine source or location of problem.
2) Correct the problem.
3) Re-Execute GLAS_Exec.

5.4 Emergency Procedures

Not applicable in V0.

5.5 Diagnostic Procedures

To determine the error or status of an execution instance of GLAS_Exec, review the error and status messages in the output ANC06 file. Use the UNIX grep command to search on keywords or other text strings.

Appendix A
CONTROL FILE KEYWORDS, VALUES, and V0 TEMPLATES

A.1 Control File Keywords and Fixed Values

Table 5-1 Control File Keywords and Corresponding Values

Keyword	Values
SURFACE_TYPE	ALL (default)
	LAND
	OCEAN
	SEAICE
	ICESHEET
L1A_PROCESS	ALL
	NONE (default)
	L_Gen_ALT
	L_Gen_ATM
	L_Gen_ATT
	L_Gen_ENG
WAVEFORM_PROCESS	ALL
	NONE (default)
	W_Assess
	W_DetGeoSurTyp
	W_CalcOtherCh
ATMOSPHERE_PROCESS	ALL
	NONE (default)
	A_interp_pod
	A_interp_met
	A_mbscs
	A_cal_cofs
	A_ir_bscs
	A_g_bscs

Table 5-1 Control File Keywords and Corresponding Values

Keyword	Values
	A_avg_bscs
	A_cld_lays
	A_pbl_aer_lays
	A_aer_lays
	A_cld_opt_prop
	A_aer_opt_prop
ELEVATION_PROCESS	ALL
	NONE (default)
	E_CalcLoadTD
	E_CalcOceanTD
	E_CalcEarthTD
	E_CalcPoleTD
	E_GetGeoid
	E_CalcTrop
	E_IntrpPOD
	E_CalcStdIR
	E_CalcLdIR
	E_CalcOcIR
	E_CalcSiIR
	E_CalcIsIR
	E_CalcStdSp

A.2 End to End Control File Template

```
#
# end-to-end control file template
#
# This control file reads GLA00 data, executes
# all sub-ATBD procedures, and writes GLA01-02,
# and GLA05-GLA15 data.
#
# The following fields must be changed for each
# instance of this template.
#
```

```
TEMPLATE=end-to-end.template
EXEC_KEY= _unique_execution_sequence_key_
DATE_GENERATED= _date_generated_
OPERATOR= _operator_userid_
CYCLE=_cycle_
TRACK=_track_
INPUT_FILE=GLA00_input_filename_ _version_
INPUT_FILE=ANC07_constants.dat _version_
OUTPUT_FILE=GLA01_output_filename_ _version_
OUTPUT_FILE=GLA02_output_filename_ _version_
OUTPUT_FILE=GLA05_output_filename_ _version_
OUTPUT_FILE=GLA06_output_filename_ _version_
OUTPUT_FILE=GLA07_output_filename_ _version_
OUTPUT_FILE=GLA08_output_filename_ _version_
OUTPUT_FILE=GLA09_output_filename_ _version_
OUTPUT_FILE=GLA10_output_filename_ _version_
OUTPUT_FILE=GLA11_output_filename_ _version_
OUTPUT_FILE=GLA12_output_filename_ _version_
OUTPUT_FILE=GLA13_output_filename_ _version_
OUTPUT_FILE=GLA14_output_filename_ _version_
OUTPUT_FILE=GLA15_output_filename_ _version_
OUTPUT_FILE=ANC06_output_filename_ _version_
#
# The following fields should not be modified
# during standard use of this file
#
SURFACE_TYPE=ALL
L1A_PROCESS=ALL
ELEVATION_PROCESS=ALL
WAVEFORM_PROCESS=ALL
ATMOSPHERE_PROCESS=ALL
END_OF_CONTROL_FILE
```

A.3 Atmosphere Control File Template

```
#
# atmosphere control file template
#
# This control file reads GLA02 data, executes
# the Atmosphere sub-ATBD procedures, and writes
# and GLA07-GLA11 data.
#
# The following fields must be changed for each
# instance of this template.
#
TEMPLATE=atm.template
EXEC_KEY= _unique_execution_sequence_key_
DATE_GENERATED= _date_generated_
OPERATOR= _operator_userid_
CYCLE=_cycle_
TRACK=_track_
INPUT_FILE=GLA02_input_filename_ _version_
INPUT_FILE=ANC07_constants.dat _version_
OUTPUT_FILE=GLA07_output_filename_ _version_
OUTPUT_FILE=GLA08_output_filename_ _version_
OUTPUT_FILE=GLA09_output_filename_ _version_
OUTPUT_FILE=GLA10_output_filename_ _version_
OUTPUT_FILE=GLA11_output_filename_ _version_
OUTPUT_FILE=ANC06_output_filename_ _version_
#
# The following fields should not be modified
# during standard use of this file
#
SURFACE_TYPE=ALL
ATMOSPHERE_PROCESS=ALL
END_OF_CONTROL_FILE
```

A.4 Elevation Control File Template

```
#
# elevation control file template
#
# This control file reads GLA05 data, executes
# elevation sub-ATBD procedures, and writes GLA06
# and GLA12-GLA15 data.
#
# The following fields must be changed for each
# instance of this template.
#
TEMPLATE=elev.template
EXEC_KEY= _unique_execution_sequence_key_
DATE_GENERATED= _date_generated_
OPERATOR= _operator_userid_
CYCLE=_cycle_
TRACK=_track_
INPUT_FILE=GLA05_input_filename_ _version_
INPUT_FILE=ANC07_constants.dat _version_
OUTPUT_FILE=GLA06_output_filename_ _version_
OUTPUT_FILE=GLA12_output_filename_ _version_
OUTPUT_FILE=GLA13_output_filename_ _version_
OUTPUT_FILE=GLA14_output_filename_ _version_
OUTPUT_FILE=GLA15_output_filename_ _version_
OUTPUT_FILE=ANC06_output_filename_ _version_
#
# The following fields should not be modified
# during standard use of this file
#
SURFACE_TYPE=ALL
ELEVATION_PROCESS=ALL
END_OF_CONTROL_FILE
```

A.5 Partial Elevation Control File Template

```
#
# partial elevation control file template
#
# This control file reads GLA05 data, executes
# elevation sub-ATBD procedures, and writes GLA06 data.
#
# The following fields must be changed for each
# instance of this template.
#
TEMPLATE=part_elev.template
EXEC_KEY= _unique_execution_sequence_key_
DATE_GENERATED= _date_generated_
OPERATOR= _operator_userid_
CYCLE=_cycle_
TRACK=_track_
INPUT_FILE=GLA05_input_filename_ _version_
INPUT_FILE=ANC07_constants.dat _version_
OUTPUT_FILE=GLA06_output_filename_ _version_
OUTPUT_FILE=ANC06_output_filename_ _version_
#
# The following fields should not be modified
# during standard use of this file
#
SURFACE_TYPE=ALL
ELEVATION_PROCESS=E_CalcLoadTD
ELEVATION_PROCESS=E_CalcOceanTD
ELEVATION_PROCESS=E_CalcEarthTD
ELEVATION_PROCESS=E_CalcPoleTD
ELEVATION_PROCESS=E_GetGeoid
ELEVATION_PROCESS=E_CalcTrop
ELEVATION_PROCESS=E_IntrpPOD
ELEVATION_PROCESS=E_CalcStdIR
ELEVATION_PROCESS=E_CalcLdIR
ELEVATION_PROCESS=E_CalcOcIR
ELEVATION_PROCESS=E_CalcSiIR
ELEVATION_PROCESS=E_CalcIsIR
ELEVATION_PROCESS=E_CalcSpLoc
ELEVATION_PROCESS=E_AtmQF
ELEVATION_PROCESS=E_CalcSlope
ELEVATION_PROCESS=E_CalcRefl
END_OF_CONTROL_FILE
```

Abbreviations & Acronyms

ALT	designation for the EOS-Altimeter spacecraft series
DAAC	Distributed Active Archive Center
EDOS	EOS Data and Operations System
EOC	EOS Operating Center
EOS	NASA Earth Observing System Mission Program
EOSDIS	Earth Observing System Data and Information System
GDS	GLAS Ground Data System
GLAS	Geoscience Laser Altimeter System instrument or investigation
GPS	Global Positioning System
GSFC	NASA Goddard Space Flight Center at Greenbelt, Maryland
GSFC/WFF	NASA Goddard Space Flight Center/Wallops Flight Facility at Wallops Island, Virginia
ID	Identification
IEEE	Institute for Electronics and Electrical Engineering
IST	GLAS Instrument Support Terminal
LASER	Light Amplification by Stimulated Emission of Radiation
LIDAR	Light Detection and Ranging
N/A	Not (/) Applicable
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
POD	Precision Orbit Determination
SCF	GLAS investigation Science Computing Facility and workstation(s)
SDPS	Science Data Processing Segment
TBD	to be determined, to be done, or to be developed
UNIX	the operating system jointly developed by the AT&T Bell Laboratories and the University of California-Berkeley System Division

Glossary

aggregate	A collection, assemblage, or grouping of distinct data parts together to make a whole. It is generally used to indicate the grouping of GLAS data items, arrays, elements, and EOS parameters into a data record. For example, the collection of Level 1B EOS Data Parameters gathered to form a one-second Level 1B data record. It could be used to represent groupings of various GLAS data entities such as data items aggregated as an array, data items and arrays aggregated into a GLAS Data Element, GLAS Data Elements aggregated as an EOS Data Parameter, or EOS Data Parameters aggregated into a Data Product record.
array	An ordered arrangement of homogenous data items that may either be synchronous or asynchronous. An array of data items usually implies the ability to access individual data items or members of the array by an index. An array of GLAS data items might represent the three coordinates of a georeference location, a collection of values at a rate, or a collection of values describing an altimeter waveform.
file	A collection of data stored as records and terminated by a physical or logical end-of-file (EOF) marker. The term usually applies to the collection within a storage device or storage media such as a disk file or a tape file. Loosely employed it is used to indicate a collection of GLAS data records without a standard label. For the Level 1A Data Product, the file would constitute the collection of one-second Level 1A data records generated in the SDPS working storage for a single pass.
header	A text and/or binary label or information record, record set, or block, prefacing a data record, record set, or a file. A header usually contains identifying or descriptive information, and may sometimes be embedded within a record rather than attached as a prefix.
item	Specifically, a data item. A discrete, non-decomposable unit of data, usually a single word or value in a data record, or a single value from a data array. The representation of a single GLAS data value within a data array or a GLAS Data Element.
label	The text and/or binary information records, record set, block, header, or headers prefacing a data file or linked to a data file sufficient to form a labeled data product. A standard label may imply a standard data product. A label may consist of a single header as well as multiple headers and markers depending on the defining authority.
Level 0	The level designation applied to an EOS data product that consists of raw instrument data, recorded at the original resolution, in time order, with any duplicate or redundant data packets removed.
Level 1A	The level designation applied to an EOS data product that consists of reconstructed, unprocessed Level 0 instrument data, recorded at the full resolution with time referenced data records, in time order. The data are annotated with ancillary information including radiometric and geometric calibration coefficients, and georeferencing parameter data (i.e., ephemeris data). The included, computed coefficients and parameter data have not however been applied to correct the Level 0 instrument data contents.

Level 1B	The level designation applied to an EOS data product that consists of Level 1A data that have been radiometrically corrected, processed from raw data into sensor data units, and have been geolocated according to applied georeferencing data.
Level 2	The level designation applied to an EOS data product that consists of derived geophysical data values, recorded at the same resolution, time order, and georeference location as the Level 1A or Level 1B data.
Level 3	The level designation applied to an EOS data product that consists of geophysical data values derived from Level 1 or Level 2 data, recorded at a temporally or spatially resampled resolution.
Level 4	The level designation applied to an EOS data product that consists of data from modeled output or resultant analysis of lower level data that are not directly derived by the GLAS instrument and supplemental sensors.
metadata	The textual information supplied as supplemental, descriptive information to a data product. It may consist of fixed or variable length records of ASCII data describing files, records, parameters, elements, items, formats, etc., that may serve as catalog, data base, keyword/value, header, or label data. This data may be parsable and searchable by some tool or utility program.
orbit	The passage of time and spacecraft travel signifying a complete journey around a celestial or terrestrial body. For GLAS and the EOS ALT-L spacecraft each orbit starts at the time when the spacecraft is on the equator traveling toward the North Pole, continues through the equator crossing as the spacecraft ground track moves toward the South Pole, and terminates when the spacecraft has reached the equator moving northward from the South Polar region.
parameter	Specifically, an EOS Data Parameter. This is a defining, controlling, or constraining data unit associated with a EOS science community approved algorithm. It is identified by an EOS Parameter Number and Parameter Name. An EOS Data Parameter within the GLAS Data Product is composed of one or more GLAS Data Elements
pass	A sub-segment of an orbit, it may consist of the ascending or descending portion of an orbit (e.g., a descending pass would consist of the ground track segment beginning with the northernmost point of travel through the following southernmost point of travel), or the segment above or below the equator; for GLAS the pass is identified as either the northern or southern hemisphere portion of the ground track on any orbit
product	Specifically, the Data Product or the EOS Data Product. This is implicitly the labeled data product or the data product as produced by software on the SDPS or SCF. A GLAS data product refers to the data file or record collection either prefaced with a product label or standard formatted data label or linked to a product label or standard formatted data label file. Loosely used, it may indicate a single pass file aggregation, or the entire set of product files contained in a data repository.
record	A specific organization or aggregate of data items. It represents the collection of EOS Data Parameters within a given time interval, such as a one-second data record. It is the first level decomposition of a product file.

Standard Data Product	Specifically, a GLAS Standard Data Product. It represents an EOS ALT-L/ GLAS Data Product produced on the EOSDIS SDPS for GLAS data product generation or within the GLAS Science Computing Facility using EOS science community approved algorithms. It is routinely produced and is intended to be archived in the EOSDIS data repository for EOS user community-wide access and retrieval.
variable	Usually a reference in a computer program to a storage location, i.e., a place to contain or hold the value of a data item.